

latter would be more closely related than if they were placed in different varieties, or different species.

The question of paramount importance is "How are these individuals related," not "To what category should each be assigned?" If an analogy might be used, we could consider a river system. It matters little whether the tributaries are called creeks, runs, streams, rills, brooks, or rivers. The important aspect concerns their location, depth, breadth, and rate of flow. So with our plants, the "species problem" concerns not so much what constitutes a species, but rather, what are the attributes of the individuals included in each species. As our knowledge of these attributes grows, apparently conflicting evidence will tend to disappear, since there can be no conflict in truth, and a more accurate portrayal of relationships will be possible.

Department of Botany,
University of Nebraska, Lincoln

APACHE PINE AND ITS RELATIONSHIP TO PONDEROSA PINE

N. T. MIROV¹

Righter and Duffield (1951) described a hybrid obtained by crossing ponderosa pine (*Pinus ponderosa* Laws.) and Apache pine (*P. latifolia* Sarg.). The hybrid possessed several advantageous characters, such as a long taproot and rapidity of growth. It appears to be interesting to inquire into the taxonomic status of the parents because their relationship is far from being settled.

Some botanists (Shaw, 1914, p. 66) consider the Apache pine of southwestern United States and Mexico merely a variety of ponderosa pine. From their point of view the hybrid *P. latifolia* × *P. ponderosa* is, then, the product of an intraspecific hybridization, i.e. hybridization of two varieties of the same species. Others (Sudworth, 1917, pp. 33-35) believe that Apache and ponderosa pines are distinct species; thus the hybrid should be considered, by those who share this opinion, as the result of a distant (interspecific) hybridization.

Ponderosa pine is a generally recognized species. The several varieties which have been described under it (such as var. *scopulorum* Lemmon or var. *nigricans* Lemmon) are considered valid by some botanists, while others do not believe that these entities merit varietal status. (*Pinus Jeffreyi* Grev. & Balf., at one time regarded as a variety of *P. ponderosa*, is now considered a distinct species by most workers.)

¹ Physiologist, Institute of Forest Genetics, California Forest and Range Experiment Station, maintained by the Forest Service, U. S. Department of Agriculture, in cooperation with the University of California, Berkeley. The experimental work on which this paper is based was aided by a grant from the Rockefeller Foundation.

The status of Apache pine, however, is more complicated. Specimens of this pine have been described by various botanists as distinct species (*P. macrophylla* Engelm., 1887; *P. latifolia* Sarg., 1889; *P. apachea* Lemmon, 1894; *P. mayriana* Sudw., 1897). All these names signify that Apache pine may be entitled to the rank of a species. On the other hand, Shaw (1914) does not consider Apache pine as distinct from ponderosa pine and places these names in synonymy under *P. ponderosa*. (In the new Forest Service Check List . . . , Trees of the United States, Handbook 41, Wash., 1953, Apache Pine is listed as *P. engelmannii*.)

Herbarium specimens of *P. latifolia* and *P. ponderosa* are very similar in appearance. However, foresters and those botanists who are familiar with the two pines growing under natural conditions, are aware of many characters of Apache pine that are different from the characters of ponderosa pine. These characters are: long, lush-green foliage, deep taproot of seedlings, a seedling "grass stage" similar to that of *P. palustris* and (in lesser degree) of *P. montezumae*, red-brown color of bark scales, and others. It is on these bases that Apache pine was considered to be a distinct species by the early workers.

Recent biochemical investigations of ponderosa and Apache pines, conducted at the Institute of Forest Genetics, furnish additional information in regard to the botanical relationship of the two. It was found that all investigated varieties of ponderosa pine—from California, northern Idaho, the Black Hills of South Dakota, Colorado, Utah, and Arizona (Haagen-Smit et al., 1950; Iloff and Mirov, 1954, Mirov, 1951) may be characterized by the presence in their turpentine of large quantities of a terpene, delta-3-carene. This terpene may be thus considered as a specific character of ponderosa pine throughout its range. On the contrary, turpentine of Apache pine does not contain any delta-3-carene. Thus, taking into consideration its chemical characters, Apache pine should be classified as a distinct species and not as a variety of ponderosa pine.

Berkeley, California

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